CLAIMS

We claim:

1. An optical modulator, comprising:

a substrate;

three substantially planar reflectors arranged substantially mutually orthogonal to each other and wherein said planar reflectors comprise:

a base reflector disposed substantially in the plane of said substrate; and

first and second side reflectors operably coupled to said base reflector;

a pair of electrically conductive traces operably connected to said base reflector;

an electrically conductive pad operably connected to each of said conductive traces; and

a biasing source operably coupled to said conductive pads for providing a modulated voltage to said base reflector.

2. The optical modulator of claim 1, further comprising:

a source for directing a beam of incident electromagnetic energy to said substantially planar reflectors; and

a detector for collecting a reflected beam of modulated electromagnetic energy from said substantially planar reflectors.

3. The optical modulator of claim 1 wherein said base reflector comprises at least one layer by which the reflection properties of said base reflector is altered with an applied voltage.

4. The optical modulator of claim 1 wherein said base reflector comprises an electrochromic stack.

5. The optical modulator of claim 4 wherein said electrochromic stack comprises:
an ion storage layer;
an ion conductive layer disposed on said ion storage layer; and
an electrochromic layer disposed on said ion conductive layer.

6. The optical modulator of claim 5 wherein said ion storage layer comprises lithium vanadium oxide.

7. The optical modulator of claim 5 wherein said ion conductive layer comprises Li_2O-CeO_2-SiO_2.

8. The optical modulator of claim 5 wherein said ion conductive layer comprises $LiAlF_4$.

9. The optical modulator of claim 5 wherein said electrochromic layer comprises tungsten oxide.

10. The optical modulator of claim 1 wherein said base reflector comprises a plurality of layers which form a capacitive structure.

11. The optical modulator of claim 10 wherein said plurality of layers includes an electro-optic material.

12. The optical modulator of claim 1, further comprising:

a first structural member operably coupled to said first side reflector and said substrate;

a first locking hinge operably coupled to said first structural member, wherein said first locking hinge further comprises:

a first mini-locking plate operably coupled to said first structural member and said substrate, wherein said first mini-locking plate comprises a first groove;

a first rod with a first end and a second end, wherein said first end of said first rod locks into said first groove and said second end of said first rod is operably coupled to said substrate;

a tenon operably coupled to said first side reflector;

a second structural member operably coupled to said second side reflector and said substrate, further comprising a mortise into which said tenon is inserted;

a third structural member operably coupled to said second side reflector and said substrate;

a second locking hinge operably coupled to said third structural member, wherein said second locking hinge further comprises:

a second mini-locking plate operably coupled to said third structural member and said substrate, wherein said second mini-locking plate comprises a second groove;

a second rod with a first end and a second end, wherein said first end of said second rod locks into said second groove and said second end of said second rod is operably coupled to said substrate; and

a locking plate operably coupled to said substrate, said locking plate comprising a slot into which one edge of said second structural member is inserted.

13. A method of fabricating an optical modulator, comprising the steps of:

providing a silicon substrate;

forming a silicon nitride layer on said silicon substrate;

forming a first polycrystalline silicon layer on said silicon nitride layer;

patterning said first polycrystalline silicon layer;

forming a first silicon dioxide layer on said first patterned polycrystalline silicon layer;

patterning said first silicon dioxide layer;

forming a second polycrystalline silicon layer on said first patterned silicon dioxide layer;

patterning said second polycrystalline silicon layer;

forming a second silicon dioxide layer on said second patterned polycrystalline silicon layer;

patterning said second silicon dioxide layer;

forming a third polycrystalline silicon layer on said second patterned silicon dioxide layer;

patterning said third polycrystalline silicon layer;

forming a metal layer on said third patterned polycrystalline silicon layer;

patterning said metal layer;

removing said first and second silicon dioxide layers to effect release of first and second side reflectors;

forming an active layer or stack on said metal layer; and

patterning said active layer or stack to form a base reflector and associated conductive traces for biasing.

14. The method of claim 13 further comprising the steps of:

positioning said first and second side reflectors substantially orthogonal to each other and said base reflector;

operably coupling a biasing means to said base reflector.

15. The method of claim 13 wherein said biasing means comprises a microsensor.

16. The method of claim 13 wherein said microsensor is selected from the group consisting of chemical sensors, biological sensors, vibration sensors, radiological sensors, temperature sensors, photonic sensors, acoustic sensors, magnetic sensors, electromagnetic sensors, ionization sensors, humidity sensors, and pH sensors.

17. A method of fabricating an optical modulator system comprising the steps of:

providing at least one optical modulator;

providing an active layer or stack biasing means to said at least one optical modulator;

operably coupling at least one source of electromagnetic radiation to said at least one optical modulator;

providing at least one detector operably coupled to the reflected electromagnetic radiation from at least one optical modulator;

operably coupling said active layer or stack biasing means to receive environmental stimuli;

modulating a biasing voltage in response to said environmental stimuli;

modulating the reflectivity of said active layer or stack of at least one optical modulator in response to said biasing voltage;

modulating the intensity of the reflected electromagnetic energy from at least one optical modulator; and

detecting the modulated electromagnetic radiation from at least one optical modulator characteristic of said environmental stimuli.

18. A method of fabricating an optical modulator comprising the steps of:

providing a substrate;

forming a photoresponsive layer on said substrate;

exposing said photoresponsive layer to electromagnetic energy;

developing said photoresponsive layer to form at least one corner cube reflector; and

electroplating said photoresponsive layer to form a master structure.

19. The method of claim 18 further comprising the steps of:

forming an active reflective layer on said at least one corner cube reflector on said master structure; and

providing a biasing means to said active reflective layer.

20. The method of claim 19 further comprising the steps of:

using said master structure to replicate said at least one corner cube reflector.